Sample and Reviews on Final Examination (Online)

Fill-in or Paste your Answer, Transfer to PDF and Email to me (tch@cc.ncue.edu.tw) by 11:30

Course：***IC Testing*** Date：2021/6/7 (Mon.) Time：09:20~11:00 Place：Online

Reg. No.：_____ Student's Name：_____

I. TRUE OR FALSE (Mark ○ or X, 20%):

( ) 1. The 'slow' in a 'slow-fast-slow' delay test is to make sure correct input and output of initial vector and response respectively.
( ) 2. 0-1 march test ⇑$w0$⇑$r0$⇑$w1$⇑$r1$ detects more faults than ⇑$w0r0$⇑$w1r1$.
( ) 3. To test the 4-way bridge fault A>B@0 between gates A and B, A and B are justified by 1 and week 1 (w1) and propagate 1 and w1/0, respectively.
( ) 4. α-power model can be fit to most continuous functions within a local period.
( ) 5. IC test can be fully saved if a fault tolerant mechanism is built in.
( ) 6. The frequency of an oscillating ring connected by 17 inverters will be reduced when the delay time of all inverters increase.
( ) 7. A golden test proves that two products under test are good if their outputs are the same with the same input.
( ) 8. High-acceleration life test (HALT) is applied to screen out the early failure.
( ) 9. Test compression guarantees that the test set won't be distorted or changed with a fewer size.
( ) 10. Boundary Scan (IEEE1149.1) can be applied for programming EEPROMs.

II. MULTIPLE CHOICE (Choose the best one, 20%):

( ) 1. Which program reads a language and constructs efficient data structures: (A) parser (B) loader (C) interpreter (D) script.
( ) 2. Backtracking of a recursive subprogram needs to (A) recover global data (B) recover local data (C) backtracing (D) backpropagation.
( ) 3. Which is a tool for testing? (A) virtuoso (B) design compiler (C) HFS (D) tmax.
( ) 4. How many bits can be corrected if Hamming distance d=5? (A) 1 (B) 2 (C) 3 (D) 4.
( ) 5. Except 20 redundant faults, 72 of 80 non-redundant faults can be tested. Test efficiency= (A) 72% (B) 80% (C) 90% (D) 100%.
( ) 6. Which is mainly responsible for transistor-level simulation? (A) Encounter (B) Debussy (C) HSPICE (D) Virtuoso.
( ) 7. The most popular design for testability in industry is (A) Scan chains (B) MBIST (C) IDDQ monitor (D) ESD.
( ) 8. The most popular test for ADC is to test its (A) offset (B) nonlinearity (C) jitter (D) dynamic range.
( ) 9. TMR corrects the fault by accepting the (A) average (B) minority (C) majority (D) last.
( ) 10. Which diagram shows the working boundaries of products? (A) I-V (B) Space-Time (C) Shmoo (D) ladder diagram.

III. QUESTIONS (120%, at most 60% adopted):

1. Design an LFSR in the external type according to the primitive characteristic polynomial, $p^*(x)$ or $p(x) = x^4 + x + 1$ (10%).

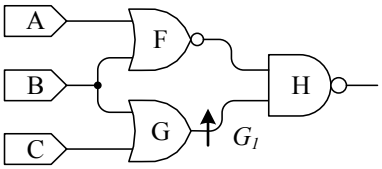
2. Encode input message word D[3:0] with three parities P[2:0] to a codeword C[7:1]={D[3:1], P[2], D[0], P[1], P[0]} in Hamming Codes using three RTL codes 'assign P[ ] =' in Verilog (10%).

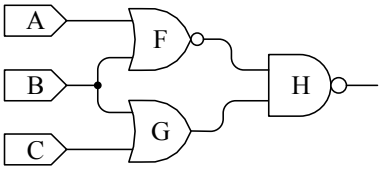
3. Give the English and Chinese terms to explain the three cycles in the bathtub curve (6%). How can we accelerate the first cycle? (4%)

4. Three march test algorithms are given as zero-one: ⇑$w0$⇑$r0$⇑$w1$⇑$r1$, read-after-write: ⇑$w0r0$⇑$w1r1$, and checkboard: (⇑wt⇑rt)t(⇑wt⇑rt), where t is a toggling value. Assume the address count is N. Fill in the table for comparison. (10%) (Note: 10 blanks)

March tests	Checkboard	Zero-one	Read-after-write
Algorithm	(⇑wt⇑rt)t(⇑wt⇑rt)		⇑$w0r0$⇑$w1r1$
#Cycles			
Stuck-at faults		V	V
Retention faults			X
Neighbor faults			

5. Given the fault list of the following circuit as $L_f = \{A_0, A_1, B_0, B_1, C_0, C_1, F_0, F_1, G_0, G_1, H_0, H_1\}$ where G_x means gate G stuck-at-x fault, (1) justify and propagate to find the test pattern T_{G1} of G_1. (2) Then do deductive fault simulation to collect all testable faults of T_{G1}. (3) Calculate the fault coverage of T_{G1}, $FC(T_{G1}, L_f)$. (20%)





6. Explain the following terms: (a) Shmoo Plot, (b) MTTF (10%)

7. (a) Explain why a simulation in traditional HSPICE is called a fresh simulation? (5%)
(b) What's differences between HALT and Burn-in ? (5%)

8. (a) Some paper claimed that a single sampling for one normal-distributed parameter can get a mean value result with only a ± 0.01 error. However, most people have known that the deviation is also about 0.01. How is the confidence level of the experiment? (5%)

(b) To achieve an error less than σ/k (k is a positive integer) in a $z\sigma$ precision, what is the least sample size? (5%)